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U.S. Geological Survey: Wisconsin Water Science Center

The mission of the U.S. Geological Survey - Water Mission Area is to provide hydrologic information and understanding needed for the optimal utilization and management of the Nation's water resources for the overall benefit of the people of the United States. The Wisconsin Water Science Center accomplishes this mission in large part through cooperation with other Federal, State, and local agencies, by:

- Systematic data collection for long-term determination and evaluation of the quantity, quality, and use of Wisconsin's water resources.
- Conducting analytical and interpretive water-resource appraisals describing the occurrence, availability, and physical, chemical, and biological characteristics of surface water and groundwater.
- Developing and operating an environmental microbiology laboratory in cooperation with USDA-Agricultural Research Service to support joint research interests on pathogen occurrence and transport in groundwater
- Conducting supportive basic and problem-oriented research in hydraulics, hydrology, and related scientific fields to improve investigation and measurement techniques, and to understand hydrologic systems in order to quantitatively predict their response to stress.
- Disseminating data and the results of investigations and research through reports, maps, Internet distribution and other computer information services.
- Coordinating the activities of Federal agencies in the acquisition of water data for streams, lakes, reservoirs, estuaries, and groundwater.
- Providing scientific and technical assistance to other Federal, State, and local agencies, to licensees of the Federal Energy Regulatory Commission, and to international agencies on behalf of the U.S. Department of State.

The Wisconsin Water Science Center is currently conducting groundwater-related cooperative projects with the Wisconsin Department of Natural Resources (WDNR), UW Systems, UW-Extension through the Wisconsin Geological and Natural History Survey (WGNHS), Southeast Wisconsin Regional Planning Commission (SEWRPC), the Mole Lake, Forest County Potawatomi, Red Cliff, Bad River, and Lac Du Flambeau Tribes of Wisconsin, the US Forest Service, and numerous county and city governments. The federal funds that support these projects come from the Cooperative Water Program, an ongoing partnership between the USGS and non-Federal agencies (http://water.usgs.gov/coop/). In addition, the Wisconsin Water Science Center conducts projects that are funded entirely by USGS Federal programs. Recent and current projects that have a significant groundwater component are listed below.

Projects funded cooperatively with state and local agencies:

1. Operation and maintenance of the Wisconsin Observation Well Network; data collection, processing, archiving, and presentation (with WGNHS).
2. Development of the Water Use in Wisconsin summary report (produced at a 5-year interval); data collection and estimation, development of water-use coefficients and default values; evaluation compiled by aquifer, geographic, and political criteria (with WDNR).
3. Evaluating land use and climate change effects on a southern Wisconsin trout stream - results of the Black Earth Creek modeling study (with WDNR and local communities and augmented by USGS Federal funds).
4. Characterization of groundwater resources in US Forests in Wisconsin (with USFS and WGNHS).
5. Simulation of the effects of water diversion from Shell Lake, Washburn County, on the shallow groundwater – lake system (with the City of Shell Lake and the WDNR).

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6. Groundwater flow and groundwater/surface-water interactions in Dane County (with WGNHS, Dane County, utilities, and other county municipalities).

Wisconsin projects funded entirely by USGS:

1. Availability and use of fresh water in the United States: Glacial Aquifer System – Upper Midwest.
2. Hydrologic and biogeochemical budgets in temperate lakes and their watersheds, northern Wisconsin Long Term Ecological Research site, http://wi.water.usgs.gov/webb/.
3. Western Lake Michigan Drainages National Water-Quality Assessment http://wi.water.usgs.gov/wmic/index.html.
4. Great Lakes Restoration Initiative work on forecasting effects of future climate and land use change.
5. Glacial Aquifer System Groundwater Availability Study, *http://mi.water.usgs.gov/projects/WaterSmart/*

USGS/ARS Laboratory for Infectious Disease and the Environment. The USGS Wisconsin Water Science Center has partnered with the US Department of Agriculture-Agricultural Research Service to fund and operate this laboratory in Marshfield, WI. This lab became operational in 2012 and has significant capabilities in the area of identification and quantification of viruses and human bacterial pathogens. The capabilities of this lab have already been instrumental in innovative studies of water quality of municipal water supplies in LaCrosse, Madison, and others cities in Wisconsin (for example, Borchardt et al., 2004; Hunt et al. 2010).
http://wgnhs.org/wofrs/WOFR2010-04a.pdf
http://www.ars.usda.gov/research/publications/publications.htm?seq_no_115=257971
http://wisconsingeologicalsurvey.org/pdfs/espdf/ES053.pdf

The first listed Priority Recommendations of the 2013 GCC Report to the Legislature is the evaluation of **"**the occurrence of viruses and other pathogens in groundwater and groundwater-sourced water supplies, and develop appropriate response tools**"**. Developing a full understanding of the water quality of domestic and municipal water supplies in the state will benefit from the capabilities and expertise made available through the Laboratory for Infectious Disease and the Environment.

Compilation of Wisconsin Water-Use Data. Every 5 years, the USGS Wisconsin Water Science Center is responsible for presenting data collected and/or estimated for withdrawals and water diversions to the USGS National Water-Use Information Program. The 2010 water-use dataset is still in development. Accompanying this dataset, a report, detailing water use in Wisconsin, is published that serves many purposes such as quantifying how much, where, and for what purpose water is used, tracking and documenting water-use trends and changes, and facilitating cooperation with other agencies to support hydrologic projects. Presently, the USGS Wisconsin Water Use 2005 report (Buchwald, 2009) is available and can be accessed through the USGS Publication Warehouse at http://pubs.er.usgs.gov/publication/ofr20091076.

Over the past year, there were five USGS investigations that incorporated a Wisconsin water-use component (listed at http://wi.water.usgs.gov/water-use/index.html. The majority of these investigations integrate water-use data into hydrologic models that evaluate the impact of water use on water resources, including calculation of water budgets, groundwater-flow paths, and baseflow contribution to surface-water features. Water-use data and the periodic report are becoming increasingly critical in understanding water use, supporting Groundwater Management Areas around the state, and supporting implementation of the Great Lakes Compact.

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Starting this year, the USGS provides its summarized water-use data, used in the compilation and stored in Aggregate Water-Use Database System (AWUDS), through NWIS Web at http://waterdata.usgs.gov/nwis. Persons will have the option to retrieve data for water use by compilation year, area (county or state), and category (e.g., public supply, industrial). Also in 2013, the USGS is developing a Data Exchange with DNR Bureau of Drinking Water and Groundwater to facilitate its cooperative program objectives. To learn more about specific project objectives, visit http://wi.water.usgs.gov/ground-water/9kh51/index.html.

The Water-Use Information Program is evolving from being a data-collection and database management program to a water-use science program, emphasizing applied research and development of techniques for statistical estimation of water use, as well as analysis of water using behaviors (National Research Council, 2002). The USGS Wisconsin Water Science Center will continue to develop new and strengthen existing partnerships to broaden the understanding of water use in Wisconsin.

Additional information about these studies and other USGS water-use products, along with summaries of data and information on Wisconsin water use can be found at the following web site: *http://wi.water.usgs.gov/data/wateruse.html*.

Groundwater assistance to Wisconsin Tribes: Several bands of the Lake Superior Chippewa Tribes have been planning expansions to their drinking-water infrastructure and, as part of that work, have needed simulations of the shallow groundwater system to understand the spatial pattern of water pumped by the proposed wells. Results for the first study for Mole Lake were published in Fienen and others (2011). Similar results for Forest County Potawatomi are forthcoming. The Bad River and Red Cliff Tribes also obtained funding from the Bureau of Indian Affairs to fund USGS to provide modeling and analysis of groundwater research on their respective reservations. This will include monitoring network design, field measurements, and state-of-the-art modeling.

Water Resources Impacts of Frac-Sand Mining: New advances in deep horizontal drilling and hydraulic fracturing ("fracking") technologies have unlocked massive natural gas reserves in shale formations in several areas around the United States. While little potential for such gas extraction is present in Wisconsin, several ancient sand formations provide ideal material for "frac-sand" which is a critical element for fracking. The sand, uniform in size and composition, is pumped into fractures that are created in the fracking process to keep them open, allowing gas to flow. The sand resources in Wisconsin are a major commodity now and sand mining has increased dramatically in the past two years. USGS, in cooperation with WGNHS and Chippewa County is undertaking a regional study in Chippewa County to characterize water resources impacts by frac sand mines and agriculture in the area. The 5-year project is currently in the last part of the planning stage and will launch in early 2013.

Background Water Resources Conditions in the Penokee/Gogebic Iron Range: Proposed taconite mining in the Bad River Watershed in northern Wisconsin has initiated increased interest in potential water resources impacts of the major land-use change. USGS Midwest Area Mining Initiative funds were provided to perform background screening level modeling of groundwater in the area around the ore body. This screening model will then be available for assisting in designing a monitoring network focused on particular impacts of concern to stakeholders. The Bad River Tribe also obtained funds through the Bureau of Indian Affairs which will expand the scope of this effort to include the Reservation in the downstream area of the Bad River watershed.

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The Glacial Aquifer System Groundwater Availability Study: This study began in 2012 and will be completed in 2016. The study will assess groundwater availability for the expansive and diverse glacial aquifer system of the United States. The glacial aquifer system is present in parts of 25 states and is subject to a range of climatic conditions from humid to semi-arid. Groundwater availability in the system may be constrained by climatic conditions (limited recharge), poor water quality from natural or man-made constituents, hydrogeology (limited storage or low hydraulic conductivity), concerns of conflicts with current groundwater users, or the desire to maintain or restore environmental streamflows. The glacial sand and gravel principal aquifer is contained within the glacial aquifer system. This principal aquifer, as defined by USGS (*Miller, 1999*), is present in parts of 22 states, glacial deposits in Idaho, Washington, and Alaska are not included in the definition given by Miller (1999). Withdrawals from the principal aquifer in 2000 were 5 percent of the total withdrawals from all aquifers (*Maupin and Barber, 2005*). The sand and gravel principal aquifer is the largest source for public supply and self-supplied industrial for any principal aquifer; and it also is an important source for irrigation supply.

The glacial aquifer system groundwater availability study is one of the USGS efforts in response to the Department of Interior WaterSMART initiative. This study is designed to provide information and analysis to stakeholders and decision makers for characterizing groundwater availability in regions within the glacial aquifer system. This study complements other regional aquifer studies through the Groundwater Resources Program designed to develop a national assessment of groundwater availability in USGS Principal Aquifers as part of a national Water Census.

The study seeks to quantify:

- the status of groundwater resources in the glacial aquifer system,
- how these resources have changed over time, and
- likely system response to future changes in anthropogenic and environmental conditions.

Evaluating land use and climate change effects on a southern Wisconsin trout stream: Results of the Black Earth Creek modeling study: A well-known trout stream and Outstanding and Exceptional Resource Water – the Black Earth Creek (BEC) watershed in northwest Dane County – is undergoing land-use conversions from agricultural to residential and commercial. Currently the long-term impacts of urbanization on the base flow and stormflow (flood peaks) is not well characterized. Urbanization may increase both stormflow (Steuer and Hunt, 2001) and non-point source loads of nutrients, pesticides, and sediments. Because increased surface flows divert water that normally recharges to the groundwater system; urbanization can result in less groundwater being discharged as base flow to streams. By understanding the interactions between surface water and groundwater systems, the effectiveness of water management alternatives used to mitigate the effects of urbanization can be evaluated. A coupled groundwater/surface-water computer model of the basin has been constructed using the USGS code GSFLOW (Markstrom and others, 2008). This approach includes all elements of the hydrologic cycle including rainfall, snowmelt, evapotranspiration, interflow, streamflow, baseflow, and groundwater flow resulting in a quantitative characterization of the entire hydrologic system.

Expansions to the Groundwater Monitoring Network: In compliance with requirements of the Great Lakes Compact monitoring mandates, the USGS, WGNHS, and WDNR are cooperatively expanding existing groundwater monitoring resources. Of particular interest are areas of substantial past and present groundwater withdrawals in southeastern Wisconsin and the Green Bay area. These additions are being made within the context of the state-wide plan for network

improvements. And these additions represent excellent progress toward more informed management of groundwater resources, particularly where pumping stresses are important.

Dane County Groundwater-Flow Model: In cooperation with the WGNHS, the Dane County Groundwater-Flow model is being comprehensively revised. This model, originally completed in 1999 and published in 2000 (Krohelski and others, 2000) has been used for planning by county and local governments throughout the county. While the 1999 model was developed using the state-of-the-art modeling and calibration tools at the time, techniques, and software continue to evolve, and additional data have been collected. As a result, updating the Dane County model using current capabilities will enhance the value of the model for planning. Improvements include better representation of surface-water features and their interactions with the groundwater system, a finer grid resolution, more representative treatment of recharge, new findings related to the stratigraphy of the county simulation of transient conditions (both historical and predictive), and improved calibration and uncertainty calculation techniques.

Groundwater and Surface Water Interactions in the Upper Fox River Valley of southeastern Wisconsin (Feinstein and others, 2012): The Fox River Valley, including Waukesha County, is experiencing rapid urbanization and consequently increasing demands on deep groundwater pumping for domestic supply needs. These demands are stressing the availability of groundwater and in some cases water-quality considerations (such as radium in Waukesha County) are making it difficult to meet the increased needs through traditional sources. One alternative is to increase pumping from locations at which the shallow aquifer is more closely connected to the surface-water system. To better understand both potential surface-water impacts due to increased shallow pumping and to characterize exchange between the shallow groundwater and surface water the USGS has constructed and applied a model using the newly developed MODFLOW-NWT code (Niswonger and others, 2011) in simulating a number of scenarios.

Great Lakes Restoration Initiative: The USEPA Great Lakes Restoration Initiative (GLRI) has a substantial footprint in Wisconsin. This large, multi-year initiative is aimed at improving water and ecological conditions throughout the Great Lakes Basin (http://www.epa.gov/glnpo/glri/). Most of the projects are not directly connected to groundwater. However, the surface-water modeling using the Precipitation Runoff Modeling System (PRMS) throughout the Basin provides important information on groundwater/surface-water interactions and recharge. PRMS modeling combined with proposed background work at several sites in the Lake Superior basin will be vital for responsible management and evaluation of proposed mining activities.

Development and use of the USGS models to evaluate climate change effects at a Northern Wisconsin Long Term Ecological Research site: Modeling has focused on the local isthmus scale (Fienen and others, 2009) as well as larger watershed-scale (Hunt and others, 2008). Initial simulations of climate-change effects on groundwater systems were performed using a a simplified representation of the system in a surface water model (Walker et al., 2012) as part of a nationwide synthesis of potential effects on watershed hydrology (Markstrom et al., 2012),. The recently developed USGS groundwater/surface-water code, GSFLOW (Markstrom and others, 2008), combines two widely used models: PRMS and MODFLOW. Using this approach, the effect of climate-change driven rainfall and temperature changes on stream flow and groundwater recharge can be predicted.

Two relatively simple climate scenarios were examined using a GSFLOW model of the USGS Trout Lake Water, Energy and Biogeochemical Budgets (WEBB) study site in northern Wisconsin, USA (Hunt and others, 2008; Walker and others, 2009). This work was followed up a

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more encompassing set of analyses using 3 IPCC emission scenarios from 4 GCMs (Markstrom and others, 2012; Hunt and others, 2012; Walker and others, 2012). Even though the simulations could be improved by inclusion of more sophisticated processes and scenarios, these results demonstrate a utility for hydrologic modeling for today's resource management actions.

Selected References:

Borchardt, M.A., Haas, N.L., and Hunt, R.J., 2004, Vulnerability of drinking-water wells in La Crosse, Wisconsin to enteric-virus contamination from surface water contributions. Applied and Environmental Microbiology, v. 70, no. 10, p. 5937-5946. doi:10.1128/AEM.70.10.5937-5946.2004

Buchwald, C.A., 2009, Water use in Wisconsin, 2005: U.S. Geological Survey Open-File Report 2009-1076

Buchwald, C.A., Luukkonen, C. L., and Rachol, C. M., 2010, Estimation of groundwater use for a groundwater-flow model of the Lake Michigan Basin and adjacent areas, 1864–2005: U.S. Geological Survey Scientific Investigations Report 2010–5068, 90 p.

Dripps, W.R., and Bradbury, K.R., 2007, A simple daily soil-water balance model for estimating the spatial and temporal distribution of groundwater recharge in temperate humid areas: Hydrogeology Journal 15: 433-444.

Feinstein, D.T., Hunt, R.J., and Reeves, H.W., 2010, Regional groundwater-flow model of the Lake Michigan Basin in support of Great Lakes Basin Water Availability and Use Studies: U.S. Geological Survey Scientific Investigations Report 2010-5109, 379 p.

Feinstein, D.T., Dunning, C.P., Juckem, P.F., and Hunt, R.J., 2010, Application of the Local Grid Refinement package to an inset model simulating the interactions of lakes, wells, and shallow groundwater, northwestern Waukesha County, Wisconsin: U.S. Geological Survey Scientific Investigations Report 2010-5214, 30 p.

Feinstein, D.T., Fienen, M.N., Kennedy, J.L., Buchwald, C.A., and M.M. Greenwood, 2012, Development and application of a groundwater/surface-water flow model using MODFLOW-NWT for the Upper Fox River Basin, southeastern Wisconsin: U.S. Geological Survey Scientific Investigations Report 2012-5108.

Fienen, M.F., Hunt, R.J., Krabbenhoft, D.P., and Clemo, T., 2009, Obtaining parsimonious hydraulic conductivity fields using head and transport observations: A Bayesian Geostatistical parameter estimation approach. Water Resources Research vol. 45, W08405,doi:10.1029/2008WR007431

Fienen, M.N., Juckem, P.F., and Hunt, R.J., 2011, Simulation of the shallow groundwater-flow system near Mole Lake, Forest County, Wisconsin. U.S. Geological Survey Scientific Investigations Report 2011–5080, 9 p. *http://pubs.usgs.gov/sir/2011/5080/*

Gebert, W.A., Walker, J.F., and Hunt, R.J., 2009, Use of streamflow data to estimate average annual recharge in Wisconsin, 1970-99. U.S. Geological Survey Fact Sheet FS-2009-3092, 4 p. *http://pubs.usgs.gov/fs/2009/3092/*

Hunt, R.J., Walker, J.F., and Doherty, J., 2008, Using GSFLOW to simulate climate change in a northern temperate climate, p. 109-113 in *MODFLOW and More 2008: Ground water and public policy, Proceedings of the 9th International Conference of the International Ground Water Modeling Center*. Golden, CO: Colorado School of Mines.

Hunt, R.J., Prudic, D.E., Walker, J.F., and Anderson, M.P., 2008, Importance of unsaturated zone flow for simulating recharge in a humid climate: Ground Water, v. 46, no. 4, p. 551-560. doi:10.1111/j.1745-6584.2007.00427.x

Hunt, R.J., Borchardt, M.A., Richards, K.D., and Spencer, S.K., 2010, Assessment of sewer source contamination of drinking water wells using tracers and human enteric viruses. Environmental Science & Technology, ES&T 44(20): 7956-7963, doi: 10.1021/es100698m

Hunt, R.J., Juckem, P.F., and Dunning, C.P., 2010, Simulation of the shallow groundwater-flow system near the Hayward Airport, Sawyer County, Wisconsin. U.S. Geological Survey Scientific Investigations Report 2010-5049, 14 p. *http://pubs.usgs.gov/sir/2010/5049/*

Hunt, R.J., Walker, J.F., Westenbroek, S.M., Hay, L.E., and Markstrom, S.L., 2012, Watershed scale response to climate change—Black Earth Creek Basin, Wisconsin. U.S. Geological Survey Fact Sheet 2011–3129, 6 p. *http://pubs.usgs.gov/fs/2011/3129/*

Juckem, P.F., 2009, Simulation of the groundwater-flow system in Pierce, Polk, and St. Croix Counties, Wisconsin: U.S. Geological Survey Scientific Investigations Report 2009–5056, 53 p. *http://pubs.usgs.gov/sir/2009/5056/*

Krohelski, J.T., Bradbury, K.R., Hunt, R.J., and Swanson, S.K., 2000, Numerical simulation of ground-water flow in Dane County, Wisconsin. Wisconsin Geological and Natural History Survey Bulletin v. 98, 31 p.

Markstrom, S.L., R.G. Niswonger, R.G., Regan, R.S., Prudic, D.E., and Barlow, P.M.. 2008, GSFLOW—Coupled ground-water and surface water flow model based on the integration of the Precipitation-Runoff Modeling System (PRMS) and the Modular Ground-Water Flow model (MODFLOW-2005). USGS Techniques and Methods 6-D1. Reston, Virginia: USGS.

Markstrom, S.L., Hay, L.E., Ward-Garrison, C.D., Risley, J.C., Battaglin, W.A., Bjerklie, D.M., Chase, K.J., Christiansen, D.E., Dudley, R.W., Hunt, R.J., Koczot, K.M., Mastin, M.C., Regan, R.S., Viger, R.J., Vining, K.C., and Walker, J.F., 2012, Integrated watershed-scale response to climate change for selected basins across the United States. U.S. Geological Survey Scientific Investigations Report 2011–5077, 143 p. *http://pubs.usgs.gov/sir/2011/5077/*

National Research Council, (edited by R. Bitterli) 2002, Estimating water use in the United States; A new paradigm for the national water-use information program: Washington D.C., National Research Press, 176 p.

Niswonger, R. G., Panday, Sorab, and Ibaraki, M Motomu, 2011, MODFLOW-NWT, A Newton formulation for MODFLOW-2005: U.S. Geological Survey Techniques and Methods 6-A37, 44 p.

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Saad, David A., 2008, Agriculture-Related Trends in Groundwater Quality of the Glacial Deposits Aquifer, Central Wisconsin: *Journal of Environmental Quality 37:S-209-S-225* (http://jeq.scijournals.org/content/vol37/5_Supplement/)

Steuer, J.J., and Hunt, R.J., 2001, Use of a Watershed-Modeling Approach to Assess Hydrologic Effects of Urbanization, North Fork Pheasant Branch Basin near Middleton, Wisconsin. USGS Water-Resources Investigations Report 01-4113. 49 p. *http://pubs.er.usgs.gov/usgspubs/wri/wri014113*

Walker, J.F., Hunt, R.J., Markstrom, S.L., Hay, L.E., and Doherty, J., 2009, Using a Coupled Ground-Water/Surface-Water Model to Predict Climate-Change Impacts to Lakes in the Trout Lake Watershed, Northern Wisconsin, in 3rd Interagency Conference on Research in the Watersheds, Estes Park, CO, U.S. Geological Survey, p. 155-161.

Walker, J.F., Hunt, R.J., Hay, L.E., and Markstrom, S.L., 2012, Watershed scale response to climate change—Trout Lake Basin, Wisconsin. U.S. Geological Survey Fact Sheet 2011–3119, 6 p. *http://pubs.usgs.gov/fs/2011/3119/*

Westenbroek, S.M., Kelson, V.A., Dripps, W.R., Hunt, R.J., and Bradbury, K.R., 2009, SWB - A modified Thornthwaite-Mather Soil Water Balance code for estimating groundwater recharge. U.S. Geological Survey Techniques and Methods 6A31, 65 p.

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